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49. A projection exposure apparatus, comprising:
an illumination optical system for illuminating a pattern formed on a mask; and
a projection optical system for projecting light from the pattern, said projection
optical system including an optical system as recited in claim 42.

50. A device manufacturing method including a process for transferring, through
projection exposure, a pattern of a mask onto a wafer by use of a projection exposure apparatus
as recited in claim 49. --

REMARKS

Applicants request favorable reconsideration and allowance of the subject application in
view of the preceding amendments and the following remarks.

To place the application in better form, a new abstract is presented in accordance with
preferred practice. No new matter is added by this change.

Claims 28, 29, 33, 34 and 38-50 are presented for consideration. Claims 28, 33 and 42
are independent. Claims 18-27, 30-32 and 35-37 have been canceled without prejudice or
disclaimer. Claims 28 and 33 have been amended to clarify features of the subject invention,
while claims 38-50 have been added to recite additional features of the subject invention.

Support for these changes and claims can be found in the original application, as filed. Therefore
no new matter has been added.

Applicants note that the Examiner has made final the election of species previously set forth, and has withdrawn claims 20, 21, 25-27, 30, 31 and 35-37 from consideration. To expedite prosecution, Applicants have canceled these claims without prejudice or disclaimer. Applicants reserve the right to file a divisional application directed to the subject matter of these claims.

Applicants further note that the Examiner has approved the proposed drawing correction filed on October 25, 2001. To expedite prosecution, Applicants submit, by separate paper, a letter transmitting corrected formal drawings, in accordance with the Examiner's request.

Applicants request favorable reconsideration and withdrawal of the rejection set forth in the above-noted Office Action.

Claims 18, 19, 22-24, 28, 29 and 32-34 were rejected under 35 U.S.C. § 102 as being anticipated by U.S. Patent No. 5,424,552 to Tsuji et al. Applicants submit that this patent does not teach many features of the present invention, as previously recited in these claims. Therefore, this rejection is respectfully traversed. Nevertheless, Applicants submit that claims 28, 29, 33, 34, and 38-50, as presented, amplify the distinctions between the present invention and the cited art.

In one aspect of the invention, independent claim 28 recites an optical system for forming an image of an object. The optical system includes an optical element, which is deformed by the weight thereof, and at least one optical member for preventing a change in optical performance of the optical system due to deformation of the optical element, when the optical element is provided in the optical system.

In another aspect of the invention, independent claim 33 recites a projection exposure apparatus that includes an illumination optical system for illuminating a pattern formed on a mask, and a projection optical system for projecting the pattern of the mask onto a wafer, the projection optical system including (i) an optical element being deformed by the weight thereof, and (ii) at least one optical member for preventing a change in optical performance of the optical system due to deformation of the optical element, when the optical element is provided in the optical system.

In still another aspect of the invention, independent claim 42 recites an optical system that includes an optical element, the optical element being deformed by the weight thereof and having a refractive power, and at least one optical member for preventing a change in optical performance of the optical system due to deformation of the optical element, when the optical element is provided in the optical system.

Applicants submit that the cited art does not teach or suggest such features of the present invention, as recited in independent claims 28, 33 and 42.

The Tsuji et al. patent shows a structure for avoiding degradation of imaging performance, which is otherwise caused by deformation of a reticle R. To this end, the Tsuji et al. patent teaches moving a projection lens when the reticle R is deformed by the weight thereof.

① It should be noted, however, that in the Tsuji et al. patent, that which is deformed is the reticle itself, as opposed to a lens of a projection optical system, for example. Accordingly, the Tsuji et al. patent does not teach or suggest that any lens incorporated into a projection lens is deformed by the weight thereof. Accordingly, that patent likewise does not teach or suggest any optical

⑦ element for preventing a change in optical performance of an optical system due to deformation of an optical element, when the optical element is provided in the optical system, in the manner of the present invention recited in the independent claims.

③ Still further, and with respect to the present invention recited in independent claim 42, the optical system has an optical element, which has a refractive power and is deformed by the weight thereof. As discussed above, the reticle R is deformed in the Tsuji et al. patent, and not an optical element having a refractive power, as in the present invention recited in independent claim 42.

For the foregoing reasons, Applicants submit that the present invention, as recited in independent claims 28, 33 and 42, is patentably defined over the cited art, whether that art is taken individually or in combination.


The dependent claims also should be deemed allowable, in their own right, for defining other patentable features of the present invention in addition to those recited in their respective independent claims. Individual consideration of these dependent claims is requested.

Applicants submit that this Amendment After Final Rejection clearly places this application in condition for allowance. This Amendment was not earlier presented because Applicants believed that the prior Amendment placed the application in condition for allowance. Accordingly, entry of the instant Amendment, as an earnest attempt to advance prosecution and reduce the number of issues, is requested under 37 CFR 1.116.

Favorable reconsideration, withdrawal of the rejection set forth in the above-noted Office Action and an early Notice of Allowance are also requested.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should be directed to our address listed below.

Respectfully submitted,


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APPENDIX A

IN THE ABSTRACT

Please cancel the current abstract and insert the following.

[An optical system includes a diffractive optical element having a diffractive optical surface, and a device for preventing a change in optical performance of the optical system due to deformation of the diffractive optical element produced when the diffractive optical element is provided in the optical system.]

-- An optical system for forming an image of an object. The optical system includes an optical element, which is deformed by the weight thereof, and at least one optical member for preventing a change in optical performance of the optical system due to deformation of the optical element, when the optical element is provided in the optical system. --

IN THE CLAIMS

28. (Amended) An optical system for forming an image of an object, said optical system comprising:

an optical element, which is [able to be] deformed by the weight thereof; and

at least one optical member for preventing a change in optical performance of said optical system due to deformation of said optical element, when said optical element is provided in said optical system.

33. (Amended) A projection exposure apparatus comprising:

an illumination optical system for illuminating a pattern formed on a mask; and

a projection optical system for projecting the pattern of the mask onto a wafer, said projection optical system including (i) an optical element being [able to be] deformed by the weight thereof, and (ii) at least one optical member for preventing a change in optical performance of said optical system due to deformation of said optical element, when said optical element is provided in said optical system.